

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(c), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(c) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 21, 2008 has been entered.

Drawings

2. The drawings are objected to because 403 in the specification page 21 should be element 402 as supported by the figures. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
4. Claims 56, 57, and 59-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamilton; Todd A. (US 5993555 A) in view of Sakai; Hiroyuki et al. (US 5070813 A). Hamilton teaches a reaction chamber (112; Figure 4) including a first flow pathway (along 136+128; Figure 4) and first flow limiting conductance (136), second flow pathway (along 132+128; Figure 4) and second flow limiting conductance (132), third flow pathway (along 142+122; Figure 4) and third flow limiting conductance (142), fourth flow pathway (along 144+124; Figure 4) and fourth flow limiting conductance (144). Further, claims 56, 57, 59-70 have numerous intended use recitations bracketting Applicant's structural elements generally directed to relative line pressures, relative flow rates, relative "switching"/"selecting" configurations, and "expose period". All of such claim limitations are deemed intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is configured of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Hamilton further teaches wherein the gas flow pathway comprises multiple gas flow pathways for purge gasses and chemical precursors which share one or more common inputs to the reactor chamber (112; Figure 4), as claimed by claim 69

Hamilton does not teach:

- i. a second gas flow pathway coupled downstream of the reaction chamber and having switchable second and fourth limiting conductances – claim 56
- ii. An atomic layer deposition (ALD) system, comprising: a gas flow pathway coupled upstream of Hamilton's reactor chamber (112; Figure 4) through selectable Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) having two or more operational modes including a low flow mode and a high flow mode; and a pumping arrangement coupled downstream of the reactor chamber (112; Figure 4) through selectable downstream flow limiting conductances having two or more operational modes including a low flow mode and a high flow mode, wherein software control is configured to switch operational modes of Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) and downstream flow limiting conductances in time-phase with one another, as claimed by claim 62. Applicant's claim limitations of "An atomic layer deposition (ALD) system:", "having two or more operational modes including a low flow mode and a high flow mode", and "configured to switch operational modes in time-phase with one another" are each claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP

2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP211.02).

- iii. The ALD apparatus of claim 62, wherein the Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) are configured to switch operational modes prior to the downstream flow limiting conductances switching operational modes, as claimed by claim 63
- iv. The ALD apparatus of claim 62, wherein the downstream flow limiting conductances include a throttle valve, as claimed by claim 64
- v. The ALD apparatus of claim 64, wherein the throttle valve comprises an annular throttle valve located within the reactor chamber (112; Figure 4), as claimed by claim 65.
- vi. The ALD apparatus of claim 65, wherein the annular throttle valve includes multiple vanes, each having an axis therethrough, as claimed by claim 66
- vii. The ALD apparatus of claim 65, wherein the annular throttle valve includes multiple blades arranged in an iris configuration, as claimed by claim 67
- viii. The ALD apparatus of claim 65, wherein the annular throttle valve includes multiple blades, each having a number of holes therethrough, at least one of the blades being rotatable about an axis such that holes extending through the rotatable blade align with holes of at least one of the other blades to provide a passage through the annular throttle valve, as claimed by claim 68

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- ix. The ALD apparatus of claim 62, wherein the Hamilton's upstream flow limiting conductances (132,134,136,142,144; Figure 4) and downstream flow limiting conductances are configured to switch operations modes according to a difference in residence times for passage of gas between (i) the upstream conductances and the reaction chamber, and (ii) the reaction chamber and the downstream conductances, as claimed by claim 70

Sakai teaches a wafer treating apparatus (Figure 1) including reaction chamber (1; Figure 1).

Sakai further teaches:

- i. a pumping (8; Figure 1, column 2; lines 45-69) arrangement coupled downstream of the reactor chamber (1; Figure 1, column 2; lines 45-69) through selectable downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) having two or more operational modes including a low flow mode and a high flow mode, wherein software control (20; Figure 1) is configured to switch operational modes of Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) - claim 62. Applicant's claim limitations of "An atomic layer deposition (ALD) system:", "having two or more operational modes including a low flow mode and a high flow mode", and "configured to switch operational modes in time-phase with one another" are each claim requirements of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably

distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

- ii. switch operational modes prior to the downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) switching operational modes, as claimed by claim 63. Applicant's claim limitations of "are configured to switch operational modes prior" is a claim requirement of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).
- iii. the downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) include a throttle valve (9; Figure 1, column 2; lines 45-69,2), as claimed by claim 64
- iv. the throttle valve (9; Figure 1, column 2; lines 45-69,2) comprises an annular throttle valve (9; Figure 1, column 2; lines 45-69,2) located within the reactor chamber (1; Figure 1, column 2; lines 45-69), as claimed by claim 65.
- v. the annular throttle valve (9; Figure 1, column 2; lines 45-69,2) includes multiple vanes (10; Figure 2; column 3; lines 1-29), each having an axis therethrough, as claimed by claim 66

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- vi. the annular throttle valve (9; Figure 1, column 2; lines 45-69,2) includes multiple blades (10; Figure 2; column 3; lines 1-29) arranged in an iris configuration, as claimed by claim 67
- vii. the annular throttle valve (9; Figure 1, column 2; lines 45-69,2) includes multiple blades (10; Figure 2; column 3; lines 1-29), each having a number of holes (a,b; Figure 2; column 3; lines 1-29) therethrough, at least one of the blades (10; Figure 2; column 3; lines 1-29) being rotatable about an axis such that holes (a,b; Figure 2; column 3; lines 1-29) extending through the rotatable blade align with holes (a,b; Figure 2; column 3; lines 1-29) of at least one of the other blades (10; Figure 2; column 3; lines 1-29) to provide a passage through the annular throttle valve (9; Figure 1, column 2; lines 45-69,2), as claimed by claim 68
- viii. Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) is configured to switch operations modes according to a difference in residence times for passage of gas between (i) the upstream conductances and the reaction chamber, and (ii) the reaction chamber and the downstream conductances, as claimed by claim 70. Applicant's claim limitation "configured to switch operations modes according to a difference in residence times for passage of gas between (i) the upstream conductances and the reaction chamber, and (ii) the reaction chamber and the downstream conductances" is a claim limitation of intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use

must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add plural Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) and pumping arrangement (8, 20; Figure 1, column 2; lines 45-69) to Hamilton's apparatus.

Motivation to add plural Sakai's downstream flow limiting conductances (9-11, 13-20; Figure 1, column 2; lines 45-69) and pumping arrangement (8, 20; Figure 1, column 2; lines 45-69) to Hamilton's apparatus is for accurate exhaust flow control as taught by Sakai (column 1, lines 53-64). Further, it is well established that the duplication of parts is obvious (In re Harza , 274 F.2d 669, 124 USPQ 378 (CCPA 1960) MPEP 2144.04).

5. Claim 58 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hamilton; Todd A. (US 5993555 A) and Sakai; Hiroyuki et al. (US 5070813 A) and further in view of Cox; Gerald M. (US 6228773 B1). Hamilton and Sakai are discussed above. Hamilton and Sakai do not teach a plasma assisted process. Cox teaches a similar processing apparatus arrangement in Figure 14, including external plasma sources 4.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Cox's plasma source to Hamilton's apparatus.

Motivation to add Cox's plasma source to Hamilton's apparatus is for providing "plasma treatment" to wafers as taught by Cox (claim 25).

Response to Arguments

6. Applicant's arguments filed May 21, 2008 have been fully considered but they are not persuasive.

7. Applicant states:

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Claim 56 is patentable inasmuch as the cited references fail to teach "a second gas flow pathway coupled downstream of the reaction chamber and having switchable second and fourth limiting conductances", as recited in claim 56. The Office Action admits that Hamilton does not teach "a second gas flow pathway coupled downstream of the reaction chamber and having switchable second and fourth limiting conductances" (Office Action, page 4), but seeks to combine the teachings of Sakai regarding downstream flow control with feedback to reject the claims. This conclusion is flawed. Even if the teachings of the references were combined in the manner suggested in the Office Action, the combination of references would be structurally different than the claimed apparatus. Sakai fails to teach "second and fourth limiting conductances", as Sakai teaches the use of a single "iris diaphragm mechanism 9" (Sakai, 2:62- 63).

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In response, the Examiner notes that his new grounds of rejection account for what is believed to be an obvious reproduction of apparatus parts. Applicant's claimed invention reproduces components in multiplicity while Sakai teaches a singular limiting conductance downstream of

the reaction chamber. See above. Under the teachings of the prior art, the Examiner believes that such a reproduction of parts is obvious.

Further, Applicant states:

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In addition, the apparatus resulting from the cited combination of references is not configurable to have "a ratio of the first flow limiting conductance to the second flow limiting conductance being nominally equal to a ratio of the third flow limiting conductance to the fourth flow limiting conductance" as recited in claim 56, because, once again, Sakai fails to teach "second and fourth limiting conductances". Hence, claim 56 is patentable over Hamilton in view of Sakai. Because claim 56 is patentable, claims 57 and 59-61 are patentable by virtue of their dependency on claim 56.

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In response, and with respect to the claimed ratio, the Examiner believes that such a claim limitation is believed to be an intended use claim limitation of the pending apparatus claims. That the combination of the prior art's apparatus is configurable to meet the claimed use is evident from the identical functional attributes of the prior art's equivalents.

Applicant further states:

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Claim 62 is patentable inasmuch as the cited references fail to teach an atomic layer deposition (ALD) system "wherein software control is configured to switch operational modes of the upstream flow limiting conductances and downstream flow limiting conductances in time- phase with one another", as recited in claim 62. Configured software control is a structurally significant

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recitation of the apparatus. Hence, claim 62 is patentable over Hamilton in view of Sakai. Because claim 62 is patentable, claims 63-70 are patentable by virtue of their dependency on claim 62

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As states above in the Examiner's new grounds of rejection the Examiner cites Sakai's system controller 20, Figure 1 for the teaching of the claimed use and control.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Friday schedule from 9am through 5pm. The official fax phone number for the 1792 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435

/Rudy Zervigon/

Primary Examiner, Art Unit 1792